CORE: linking sites of high mass star formation with their surroundings

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Aims and Strategy

• CORE is a NOEMA Large Program [1], observing 18 high-mass star forming regions at 220 GHz with multiple interferometric configurations plus the IRAM 30m.

• We seek to study accretion disks around high-mass protostars, and to understand and quantify fragmentation in high-mass star forming regions.

• The CORE data provide information on 0.3-18" scales in a range of tracers.

• Such comprehensive datasets are essential for understanding the scale-variation and impact of the local environment on fragmentation and star formation.

W3IRS4: An Example

• In the W3 star forming region (d=2kpc)[2].

• Total Luminosity of $\sim 5 \times 10^4$ L$_\odot$.

• Includes multiple evolutionary stages in one region: several cold cores, a hot core and an HII region.

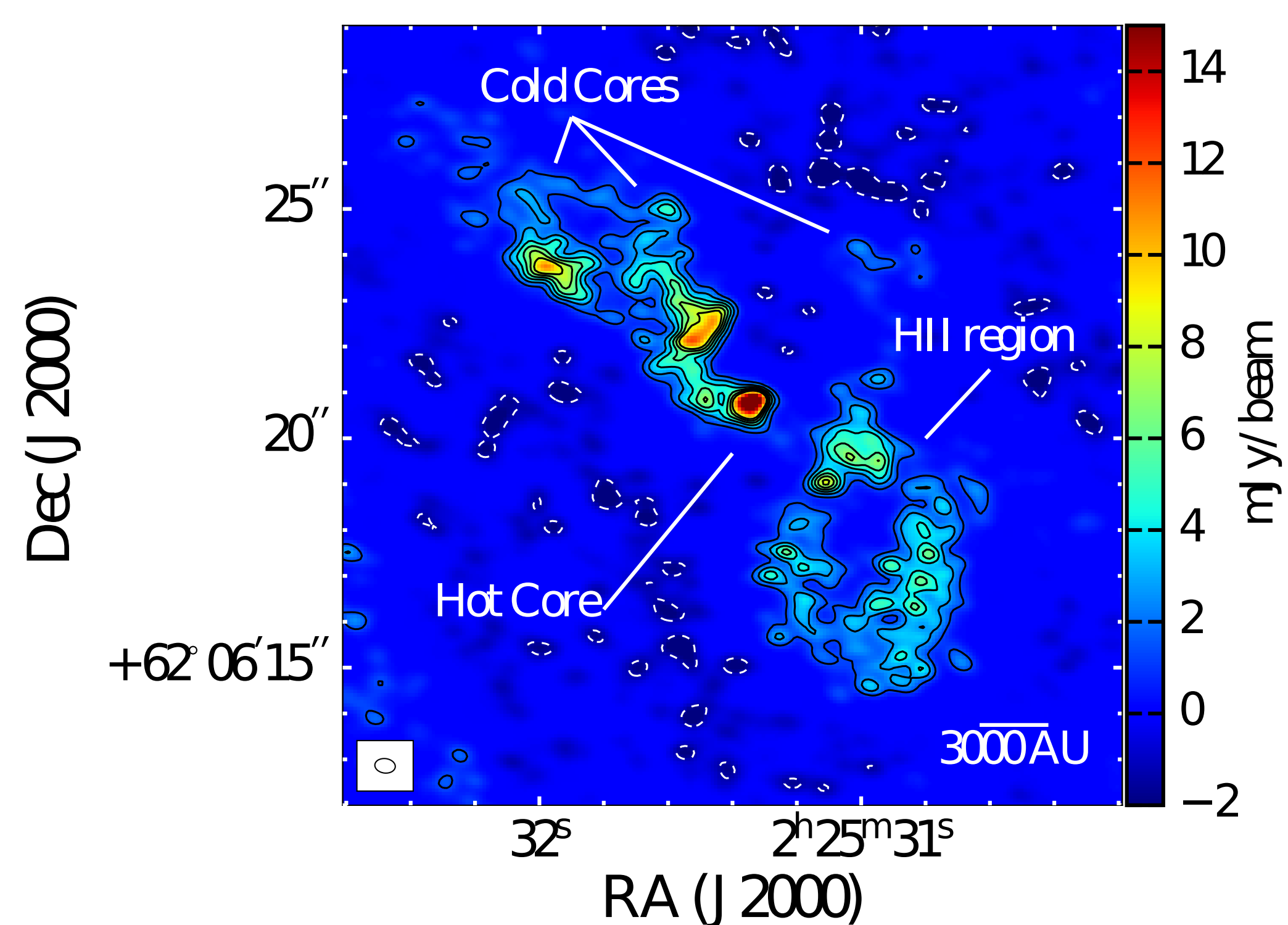• Any outflow from hot core is faint and small [3].

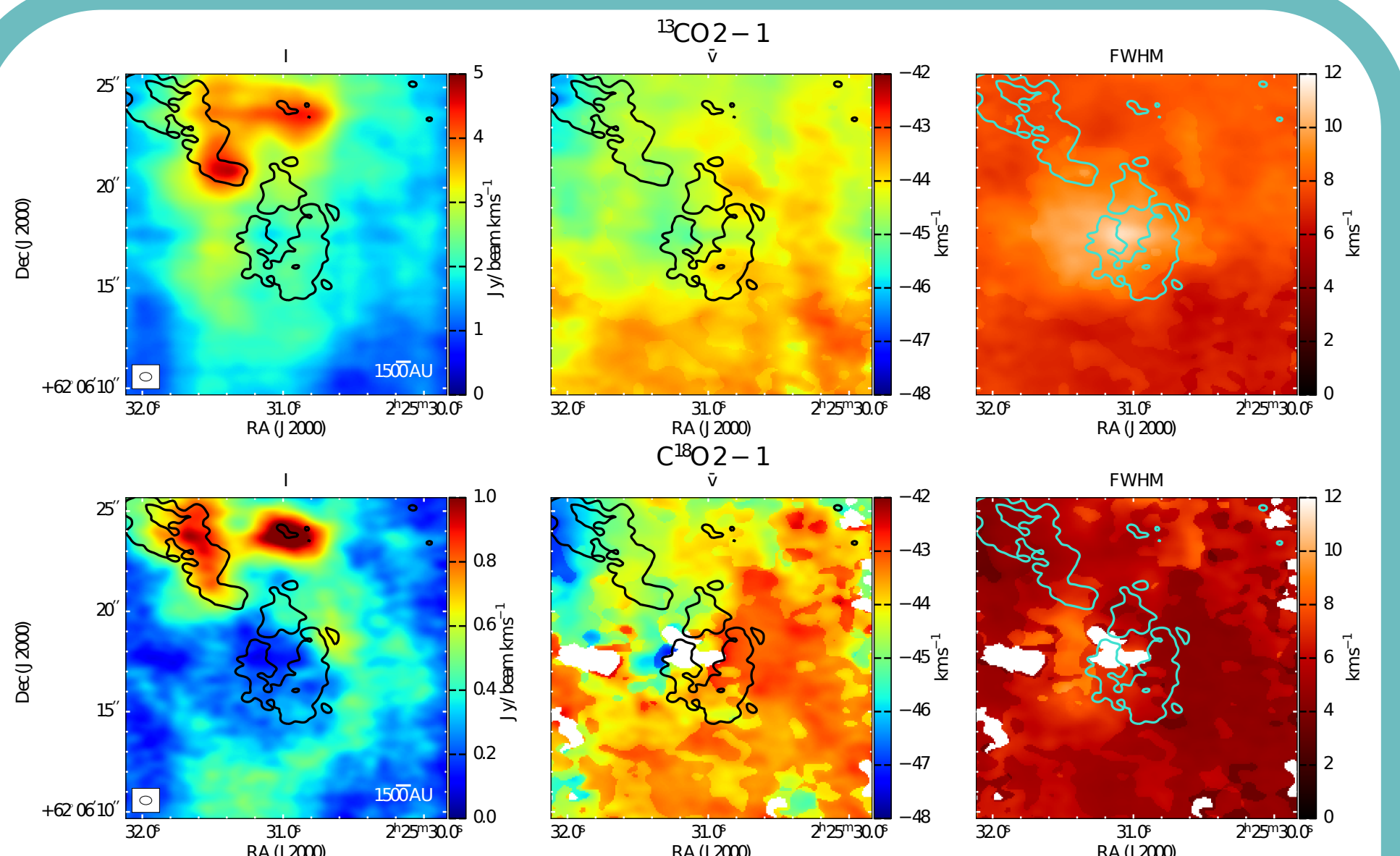Figure 1: 1.3mm continuum from combined NOEMA observations. Black contours show 5-30σ in 5σ intervals.

Figure 2: Moment 0,1 and 2 maps of ^{13}CO and C^{18}O 2-1. The contours show the 5σ level of the 1.3mm continuum.

Figure 3: Results of simultaneous fits to the H$_2$CO 3_{03}-2_{02} and 3_{22}-2_{21} lines. Contours show from 5-45σ in 10σ steps. The position of the spectra is indicated by the white square in the left-hand panels.
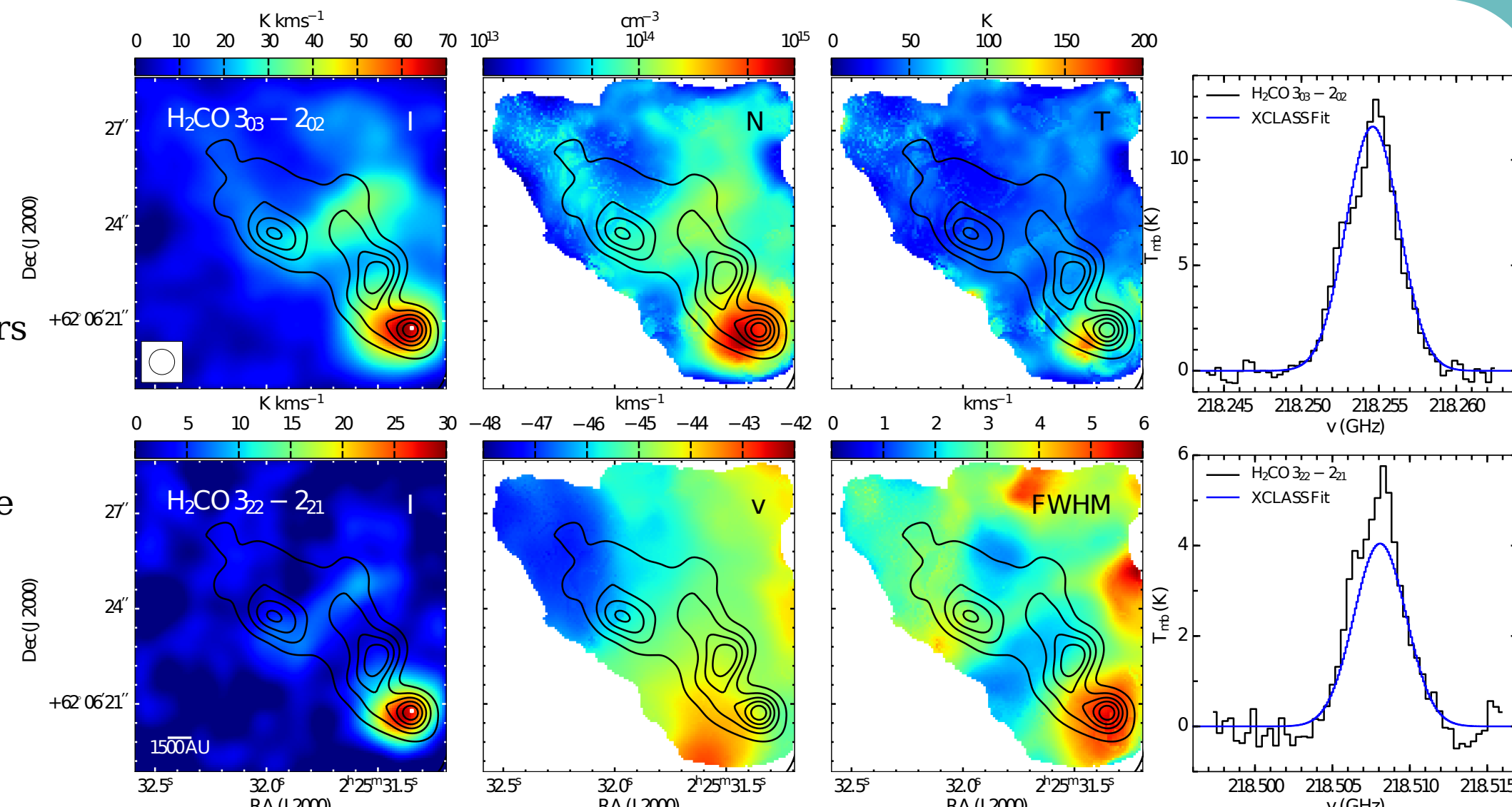
Early Results

• ^{13}CO and C^{18}O show a gas shell around the HII region around the outside of the shell traced by the continuum (Fig. 2).

• C^{18}O and H$_2$CO trace a large-scale flow towards the hot core from the cold cores (Fig.s 2 & 3).

• CH$_3$CN and other dense tracers show rotation in the hot core (Fig. 4).

Figure 4: Moment 1 maps of a number of hot-core tracers. Different transitions probe to different depths along the line of sight.

References: [1] See also talk by Henrik Beuther, [2] Hachisuka et al., 2006, [3] Wang et al., 2012